# Class 10 Mathematics · Chapter 6: Triangles

**Answer key and marking scheme** · 20 marks · about 40 minutes · based on NCERT

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**1.** A photograph 10 cm × 15 cm is enlarged to a print 20 cm × 30 cm. The photograph and the enlarged print are [1]

(a) congruent and similar
(b) similar but not congruent
(c) congruent but not similar
(d) neither congruent nor similar

**Answer: (b)** Both are rectangles, so all angles are 90°, and 20/10 = 30/15 = 2: same shape, different size. Similar, not congruent.

**2.** Which of the following statements is always true? [1]

(a) Any two similar triangles are congruent.
(b) Any two congruent triangles are similar.
(c) Any two triangles with equal perimeters are similar.
(d) Any two triangles with equal areas are congruent.

**Answer: (b)** Congruent triangles have equal angles and sides in the ratio 1 : 1, so they are similar; similar triangles need not be the same size.

**3.** On a map of a town, 1 cm stands for 500 m. The map and the town are similar figures, with representative fraction [1]

(a) $\frac{1}{500}$
(b) $\frac{1}{500000}$
(c) $\frac{1}{5000}$
(d) $\frac{1}{50000}$

**Answer: (d)** 500 m = 50 000 cm, so 1 cm on the map stands for 50 000 cm on the ground: the scale factor is 1/50 000.

**4.** In ΔABC, $\angle A = 52°$ and $\angle B = 71°$. In ΔXYZ, $\angle X = 52°$ and $\angle Y = 57°$. Then [1]

(a) ΔABC ~ ΔXYZ
(b) the triangles are not similar
(c) ΔABC ~ ΔYXZ
(d) ΔABC ~ ΔXZY

**Answer: (d)** $\angle C = 180° - 52° - 71° = 57°$ and $\angle Z = 180° - 52° - 57° = 71°$. So A ↔ X, B ↔ Z, C ↔ Y, and ΔABC ~ ΔXZY by AA.

**5.** Which pair of figures is NOT necessarily similar? [1]

(a) two rhombuses, each of side 5 cm
(b) two circles of radii 2 cm and 7 cm
(c) two right-angled isosceles triangles
(d) two regular hexagons of sides 2 cm and 5 cm

**Answer: (a)** Regular hexagons have every angle 120° and proportional sides; all circles are similar; a right isosceles triangle always has angles 90°, 45°, 45°. Two rhombuses of side 5 cm have equal sides but their angles can differ, so they need not be similar.

**6.** D and E lie on sides AB and AC of ΔABC with AD = x cm, DB = (x + 3) cm, AE = (x + 2) cm and EC = (x + 8) cm. Find x for which DE ∥ BC. [2]

DE ∥ BC exactly when AD/DB = AE/EC: $x/(x + 3) = (x + 2)/(x + 8)$. Then $x^2 + 8x = x^2 + 5x + 6$, so $3x = 6$ and $x = 2$. (Check: 2/5 = 4/10.)

- sets up $x/(x + 3) = (x + 2)/(x + 8)$ (1)
- $x = 2$ (1)


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**7.** A rectangle measures 8 cm by 12 cm. A parallelogram has sides 4 cm and 6 cm and one angle of 60°. Are the two figures similar? Give a reason. [2]

Sides: 8/4 = 12/6 = 2, so they are in the same ratio. Angles: the rectangle's are 90°, the parallelogram has a 60° angle, so corresponding angles are not equal. Both conditions are needed, so the figures are not similar.

- sides in the same ratio, 2 (1)
- angles 90° and 60° differ, so not similar (1)

**8.** ΔDEF is right-angled at E with DF = 17 cm and DE = 8 cm. ΔLMN is right-angled at M with LN = 25.5 cm and LM = 12 cm. Show that the triangles are similar and find MN. [2]

LN/DF = 25.5/17 = 1.5 and LM/DE = 12/8 = 1.5: the hypotenuse and one side are proportional, so the right triangles are similar (RHS similarity), ΔDEF ~ ΔLMN. EF = $\sqrt{(17^2 - 8^2)}$ = 15 cm, so MN = 1.5 × 15 = 22.5 cm.

- hypotenuse and side in ratio 1.5, so similar (1)
- MN = 22.5 cm (1)

**9.** In ΔPQR, S lies on PQ and T on PR such that PS·PQ = PT·PR. PS = 4 cm, PQ = 15 cm, PT = 5 cm and PR = 12 cm. (i) Prove that ΔPST ~ ΔPRQ. (ii) If QR = 10.5 cm, find ST. [3]

(i) PS·PQ = PT·PR (4 × 15 = 5 × 12 = 60) can be written PS/PR = PT/PQ, both 1/3. ∠SPT = ∠RPQ (common). The sides including the equal angles are proportional, so ΔPST ~ ΔPRQ by SAS, with S ↔ R and T ↔ Q. (ii) ST/RQ = PS/PR = 1/3, so ST = 10.5/3 = 3.5 cm.

- rewrites the product as PS/PR = PT/PQ (1)
- SAS with the common angle, ΔPST ~ ΔPRQ (1)
- ST = 3.5 cm (1)

**10.** In ΔABC, P and Q lie on AB and AC with AP = 3.6 cm, PB = 5.4 cm, AQ = 2.4 cm and QC = 3.6 cm. (i) Show that PQ ∥ BC. (ii) If BC = 7.5 cm, find PQ. [3]

(i) AP/PB = 3.6/5.4 = 2/3 and AQ/QC = 2.4/3.6 = 2/3. The ratios are equal, so PQ ∥ BC by the converse of BPT. (ii) With PQ ∥ BC, ∠APQ = ∠ABC and ∠AQP = ∠ACB (corresponding angles), so ΔAPQ ~ ΔABC (AA). PQ/BC = AP/AB = 3.6/9 = 2/5, so PQ = 7.5 × 2/5 = 3 cm.

- both ratios 2/3, PQ ∥ BC by the converse (1)
- ΔAPQ ~ ΔABC by AA (1)
- PQ = 3 cm (1)

**11.** In ΔABC, AB = AC. Points D and E lie on AB and AC such that AD = AE. Prove that DE ∥ BC. [3]

DB = AB − AD and EC = AC − AE. Since AB = AC and AD = AE, DB = EC. Hence AD/DB = AE/EC. A line dividing two sides of a triangle in the same ratio is parallel to the third side, so DE ∥ BC.

- DB = EC by subtraction (1)
- AD/DB = AE/EC (1)
- DE ∥ BC by the converse of BPT (1)


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